such intermediate forms and the realization that they are of hybrid origin. Likewise, any usable dichotomous key written for the buckeyes of eastern North America should include these hybrid forms in some way.—DEPARTMENT OF BOTANY, UNIVERSITY OF MICHIGAN.

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NOTES ON THE CLEISTOGAMOUS SPECIES OF POLYGALA IN SOUTHEASTERN UNITED STATES

CHARLES W. JAMES

In Blake's (1924) monograph of the *Polygalaceae*, two cleistogamous-flowered species of *Polygala* were included for the southeastern United States: the wide-ranging *P. polygama* Walt., known from Florida to Texas and as far north as Minnesota, Ontario, Quebec and Nova Scotia, and *P. lewtonii* Small, an endemic of the sand-scrubs of central Florida. Earlier, Blake (1915) described *P. polygama* forma *obovata*, but later (1924) did not consider it, or any other infraspecific taxon of *P. polygama*, worthy of taxonomic recognition. Subsequently, only one other species, *P. aboriginum* Small (1926), has been described. This is a poorly known "species" from the east coast of Florida (Volusia County).

In the present paper, *P. lewtonii* Small is recognized as a valid species. *P. polygama* Walt. forma *obovata* Blake is elevated to the rank of species and is renamed *P. crenata*. *P. aboriginum* Small is regarded as a synonym of *P. polygama* Walt., as is *P. polygama* Walt. var. *obtusata* Chod. The study is based on specimens from the Florida Agricultural Experiment Station Herbarium (FLAS), the Gray Herbarium (GH) and the New York

Botanical Garden (NY). The assistance of the curators of these institutions is kindly acknowledged.

Seeds are set in both cleistogamous and normal flowers in each of the three species. Whether or not the production of seeds in the cleistogamous flowers is advantageous to survival or has contributed to the evolution of these species is not known. *P. lewtonii* and *P. crenata* exhibit very little variation, providing little reason to believe that local segregates are being produced or maintained through cleistogamy. However, this does not eliminate the possibility that these two species may themselves have evolved as such segregates from *P. polygama*. The latter species presents considerable variation (in length of racemes, and in the size of floral parts and seeds), although this is to be expected to some degree because it occupies so many ecologically different regions.

The duration of these plants has been a point of question. *P. polygama* and *P. lewtonii* have been described as biennials and biennials (or annuals?), respectively. In this study, plants of all three species from many localities were observed to have remnants of previous flowering shoots which indicate that they are perennials. Southward, the shoots frequently appear to persist throughout the winter, giving rise to new ones the following spring.

The seeds and capsules are of considerable importance in the classification of members of the genus. These structures furnish the only known diagnostic features within this species group.

Key to the Species

Capsules oblong, twice as long as wide; seeds cylindric, the upper part of the arils bony like the caruncle . . . . . 1. *P. lewtonii*.

Capsules oval, less than twice as long as wide; seeds ovoid to cylindric-ovoid, the arils membranaceous throughout.

Margin of capsule with narrow, thin, crenate wing; caruncle with flexible hairs longer than those on the body of seed, the arils connivent . . . . . 2. *P. crenata*.

Margin of capsule merely ridged, entire (rarely wing-like); caruncle with short, straight, bristly hairs, no longer than those on body of seed, the arils usually divergent . . . . . 3. *P. polygama*.

1. **Polygala lewtonii** Small, Bull. Torr. Bot. Club **24:** 140. 1898. TYPE: Frostproof, Polk Co., Florida, *Lewton*, 19 March 1894 (NY). HABITAT AND DISTRIBUTION: sand-scrub areas of central Florida.—HIGH-

LANDS Co.: e. of Sebring, *Garrett 140* (FLAS); e. of Sebring, *Small 9574* (NY); e. of Sebring, *Small 11145* (FLAS, GH, NY). LAKE Co.: near Eustis, *Hunnewell 8689* (GH). MARION Co.: Ocala National Forest, *Mather*, 30 March 1949 (FLAS). ORANGE Co.: Table-top Hill, nw. of West Apopka, *Harper 15* (GH, NY). POLK Co.: Lake Wales, *King*, 28 Dec. 1948 (FLAS); Lake Davenport, *McFarlin*, 3 April 1928 (FLAS); Crooked Lake, *McFarlin*, 1925 (FLAS); Loughman, *West*, 8 May 1928 (FLAS).

Although the Highlands and Marion County citations represent an extension of range, *P. lewtonii* is nevertheless known only from the sand pine[1]-scrub type of community. This species appears to be a true endemic of the region and not merely an ecological variant of *P. polygama*. Such a belief is substantiated not only by the strong morphological features of the seeds and capsules, but by the fact that typical *P. polygama* has been collected from this same kind of habitat (*Brass 14703*, Highlands Co., Fla., GH), and the diagnostic features have remained distinctive. However, the extent to which *P. polygama* occurs within the habitat and range of *P. lewtonii* cannot be satisfactorily determined from the available collections and their data. It is known that *P. polygama* occurs in Lake and Orange Counties, also within the range of *P. lewtonii*, but in a quite different habitat (low, wet pine lands), unusual for this species.

2. **Polygala crenata** James, nom. et stat. nov.[2] Based on *Polygala polygama* Walt. forma *obovata* Blake, RHODORA **17:** 201. 1915. TYPE: New Orleans, Orleans Parish, Louisiana, *Drummond 38*, 1832 (BM). Isotype examined (GH). PARATYPE: swampy places between Tallahassee and St. Marks, Florida, *Rugel 106*, April-May 1843 (BM). Leaves from paratype examined (GH).

Stems erect, typically simple, solitary to many from a perennial root, (1.2–)2–3(–3.5) dm. high, glabrous, bearing racemes of cleistogamous flowers at the base or from the axils of the leaves; leaves glabrous, alternate, those of older shoots obovate, 1–2(–2.3) cm. long, 3–8 mm. wide, leaves of the flowering shoots smaller, obovate to elliptic, (0.5–)0.8–1.3 (–1.7) cm. long, (2–)3–5(–9) mm. wide, the bases cuneate, the apices rounded, obtuse or the upper leaves even acute, sometimes cuspidulate; racemes pyramidal, becoming cylindric, 1–1.5 cm. thick, the axis becoming 7–10(–15) cm. long, peduncles 1–2(–2.5) cm. long; bracts ovate, glabrous, deciduous, ca. 1 mm. long; pedicels becoming 3–4 mm. long; flowers light to deep pink; sepals oval to ovate, acute or obtuse, ca. 1.3–2 mm. long, glabrous; wings 4–5 mm. long, clawed at base, the blade orbicular to oval or oval-obovate, glabrous; keel 3–4 mm. long; capsule

[1] *Pinus clausa*.

[2] Neither "obovata" nor "blakeana" is available as a specific epithet.

oval, 2–2.5 mm. long and about as wide at base, apex notched, the margin narrowly winged, the wing crenate; seeds 2, ca. 2 mm. long, mostly less than 1 mm. wide, ellipsoid-ovate, but sharp pointed at base, pilose, the hairs appressed, caruncle cylindrical, bearing relatively long (some over 0.5 mm.) flexible hairs at apex, arils oval, connivent, cellular, appressed to seed, nearly 1 mm. long, less than half the length of seed.

Habitat and Distribution: low pine barrens of the Gulf Coast, from northwestern Florida into Louisiana.—**Florida.** Bay Co.: Lynn Haven, *Banker 3518* (NY); Lynn Haven, *Knight*, 21 May 1940 (FLAS); Calloway, *Hood 1685* (FLAS). Calhoun Co.: 1 mi. n. of Blountstown, *Hood 1567* (FLAS). Dixie Co.: sw. of Cross City, *Baker*, 21 April 1939 (FLAS). Franklin Co.: Apalachicola prairies, *Small 11254* (FLAS, NY). Gulf Co.: s. of Dalkeith, *Moldenke 1149a* (NY); n. of the Apalachicola-Panama Canal, *Small 11238* (NY). Jackson Co.: near Sneads, *Harper 78* (GH, NY); Cypress, *Knight*, 22 April 1941 (FLAS). Leon Co.: 10 mi. s. of Tallahassee, *Palmer 38489* (GH). Washington Co.: near Brock, *Hood 1960* (FLAS). **Mississippi.** Harrison Co.: Biloxi, *Tracy 5181* (NY). Jackson Co.: Ocean Springs, *Demaree 28659* (Gulf Coast Research Laboratory, Ocean Springs, Miss.); Kreole, *Demaree 34884* (GH); Ocean Springs, *Demaree 35053* (GH); n. of Cicoria's, *Diener 10* (Gulf Coast Research Laboratory). **Louisiana.** Orleans Parish: New Orleans, *Ingalls* (NY).

Since *P. polygama* Walt. forma *obovata* Blake was based primarily on leaf-shape, it is not surprising that plants in various sections of the range of *P. polygama* have been identified as this form. Plants with obovate leaves are common in at least three areas: the Gulf Coast (including the specimens upon which forma *obovata* was based); Arkansas and Oklahoma; and the mountainous parts of Georgia, South Carolina, North Carolina, Virginia, and Maryland. Whether or not the plants of the latter two areas deserve taxonomic recognition is not clear. This could not be determined from the mostly immature specimens at hand. However, the plants of the Gulf Coast (*P. crenata*) differ significantly from *P. polygama* in features other than mere leaf shape. They are typically smaller, erect, sparsely if at all branched, and have shorter leaves. The capsules are clearly winged, and the wings are conspicuously crenate. The seeds are smaller, with a straight caruncle bearing long, flexible hairs. In addition, *P. crenata* seems to be a species of the low, frequently wet, acid pine barrens, whereas *P. polygama* is usually found in drier, well-drained sites. Most of the specimens examined from the Gulf Coast are *P. crenata*, but the range of *P. polygama* also includes parts of this area. Although

Nash's collection (204, Lake Co., Fla.) of *P. polygama* somewhat resembles *P. crenata* in vegetative characters, no specimen was seen which could be classed as an intermediate between these two species.

3. **Polygala polygama** Walt. Fl. Carol. 179. 1788. (No specimen of this taxon is present in the Walter Herbarium.) *P. polygama* Walt. var. *obtusata* Chod. Mém. Soc. Phys. Genève 31 (2)²: 280. 1893. *P. polygama* Walt. var. *abortiva* Chod. l. c. *P. polygama* Walt. forma *albiflora* House, Bull. N. Y. State Mus. **45:** 243. 1923. *P. aboriginum* Small, Torreya **26:** 92. 1926. TYPE: "Hammock, Turtle Mound," Volusia Co., Fla., *Small*, 24 May 1926 (NY). *P. polygama* Walt. var. *ramulosa* Farwell, Am. Mid. Nat. 11: 63. 1928.

After Blake (1924) relegated var. *obtusata* to the synonymy of *P. polygama*, Fernald (1940) apparently was the first to reinstate it. However, I have been unable to correlate the morphological features upon which this variety was described with any geographical area and, therefore, it is left in the synonymy of *P. polygama*. The character upon which Fernald heavily relied in distinguishing it was the relatively condensed inflorescence. This, in general, characterizes the plants from the northernmost states and Canada, but southward the racemes may or may not be condensed, even in the same population. Temperature alone could be the limiting factor in the elongation of the inflorescence in the northern plants, whereas in the southern plants it could be a reflection of one or several other critical environmental conditions.

Variety *abortiva* was shown by Robinson (1900) to be the autumnal form of typical *P. polygama*. The same phase has also been described as var. *ramulosa*. This growth form is characterized by recurved racemes of cleistogamous flowers which are borne in upper leaf axils rather than near the base of the plant.

Small distinguished *P. aboriginum* from *P. polygama* chiefly on the relatively short pedicels and wings, quantitative characters which vary considerably in this complex. A series of specimens collected by Weber (near Fairbanks, Alachua Co., Fla., 22 April 1928, FLAS), demonstrates very well the sporadic occurrence of the reduced wings in a single population. Since this taxon is neither a strongly differentiated morphological unit, nor a geographical segregate within the species, it seems

that the rank of forma would be sufficient for it if a formal taxonomic category were shown to be desirable. GRAY HERBARIUM, HARVARD UNIVERSITY.

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REVIEW OF THE GENUS CLADONIA IN THE DISTRICT OF COLUMBIA AND VICINITY

S. F. Blake

In 1931 the late Charles A. Robbins and the writer published[1] an annotated, keyed list of the species of reindeer-moss and related forms then known from the District of Columbia region, a circle of approximately 15 miles radius about the Capitol in Washington, thus including areas in adjacent Maryland (in Montgomery and Prince Georges Counties) and Virginia (Arlington and part of Alexandria and Fairfax Counties). In those days specific distinctions in *Cladonia* were founded mostly on morphological characters with frequent assistance from the color changes brought about by treatment with caustic potash, in some cases supplemented by chloride of lime. Since that time more and more diagnostic importance has come to be attributed to the chemical constituents of the species of *Cladonia*, determined in some cases by the color changes induced by the application of new chemicals, particularly paraphenylenediamine, in others by the shape and color of the microcrystals formed by the evaporation of a solution obtained by extracting dried material of *Cladonia* with acetone or chloroform, then treating with a mixture of glycerine and glacial acetic acid or some similar compound.

[1] Cladonia in the District of Columbia and vicinity. Rhodora **33:** 145–159. pl. 210–212. 1931.